Light and Lighting

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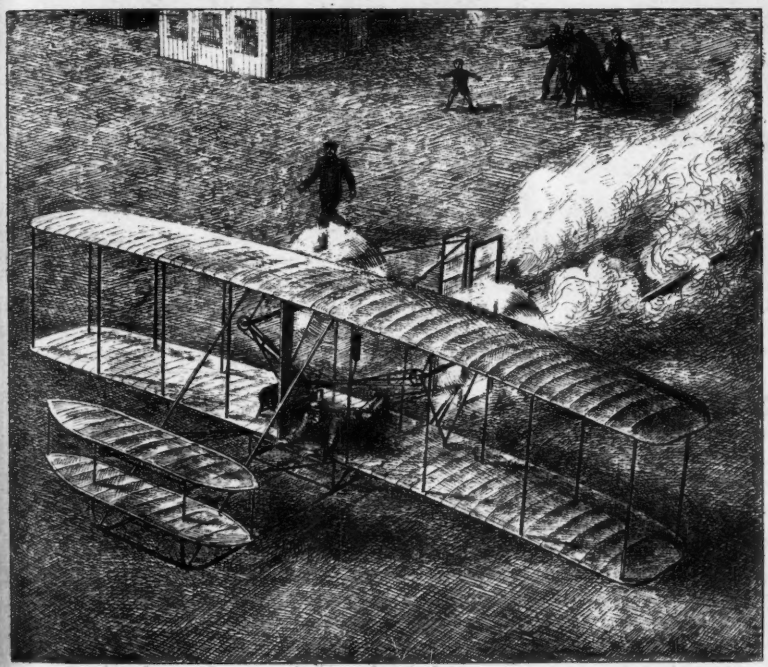

FIRST PILOTED AEROPLANE. Orville and Wilbur Wright were responsible for the first piloted, powered, sustained and controlled flight of an aeroplane. The place was Kitty Hawk, in North Carolina, and the date December 17, 1903.

The First Lighting Service Bureau.

The Lighting Service Bureau was the first institution of its kind. Established by the Electric Lamp Manufacturers' Association in 1924 it is today widely recognised as the most reliable source of lighting information.

Light and Lighting

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Lighting Education

WE are at the beginning of a new "academic year," and courses of instruction for would-be lighting engineers are commencing in London and various provincial centres. The prospect of attaining, ultimately, the hall-mark of competence which is signified by inclusion in the I.E.S. Register of Lighting Engineers will, we believe, lead to an increase in the number of students attending these courses, and this will be all to their good. It is encouraging to note that the desirability of the instruction of optical practitioners in our subject has now been recognised by the inclusion of illumination among the subjects of examination for Fellowship of the British Optical Association. It has also been recommended "that the Board of Architectural Education and the Town Planning Institute should include a study of lighting in the subjects for their qualifying examinations." We hope effect will soon be given to this recommendation.

Illumination Notes and News

Sheffield I.E.S. Centre Luncheon

The Sheffield I.E.S. Centre opened the new session with an informal luncheon which was held at the Grand Hotel, Sheffield, on Monday, October 4, and which was attended by some 70 members and guests. The occasion also marked the handing over of the chairmanship of the Centre from Mr. E. G. R. Taylor to Mr. B. Bingham.

In his brief remarks in vacating the chair Mr. Taylor referred to the work which had been done by past chairmen of the Centre in building it up to its present membership and also paid tribute to the work of Mr. D. H. Fox, who was retiring from the honorary secretaryship of the Centre. He also expressed the sense of great loss which was felt by the Sheffield Centre in the passing of Mr. J. S. Dow, who had done so much to foster the build up of I.E.S. centres throughout the country. Mr. Bingham, in taking over the chair, said that he hoped that this luncheon would be the forerunner of many more.

The toast of "The Illuminating Engineering Society" was proposed by Mr. G. R. Tomlinson, who reviewed the aims and objects of the I.E.S. and referred to the work the Society had done in the interests of good lighting. He made particular reference to the I.E.S. Code of Lighting for Building Interiors, the latest reprint of which had sold over 10,000 copies. He also pointed out that the Code had not only been accepted by official bodies and large organisations in this country but had also found acceptance overseas.

The reply to this toast was made by Mr. G. F. Cole, Secretary of the I.E.S., who said that it had been particularly gratifying, at the recent meeting of the International Commission on Illumination, to hear representatives of other countries acknowledge in no uncertain way the good work which is being done by the Illuminating Engineering Society in this country. The objects of the Society, he said, were achieved through the activities of its members, of whom the Centres represented a large proportion. Through their close contacts with industrial concerns, electrical contractors, etc., the Centres had a good opportunity of extending the membership of the Society and bringing its aims and objects to the notice of those to whom lighting is a matter of everyday importance.

He also said that had the President,

The Next I.E.S. Meeting in London

On November 9 a lecture on High Speed Photography will be given by Dr. J. W. Mitchell at a meeting of the I.E.S. to be held at the Lighting Service Bureau, 2, Savoy Hill, London, W.C.2.

Dr. Mitchell is at present on the staff of the H. H. Wills Physical Laboratory of the University of Bristol. During the war he was concerned with the high-speed photography of projectiles in flight and was mainly responsible for the development of one of the high-speed flash tubes used in that work.

Mr. J. M. Waldram, been present he was sure that he would have personally thanked the members of the Sheffield Centre for their great help in collaboration with the Leeds Centre in connection with the recent summer meeting at Harrogate.

Mr. W. G. Thompson then proposed the toast of "The Guests," amongst whom were included representatives of the Yorkshire Electricity Board, the Electrical Contractors Association, the Electrical Association for Women, and the Leeds Centre and Huddersfield Group of the I.E.S. Replies on behalf of the guests were made by Mr. A. Haddock for the Yorkshire Electricity Board, Mr. A. Webb for the E.C.A., and Mr. E. A. Fowler for the I.E.S. Leeds Centre.

Sir John Parsons

Readers will join with us in congratulating Sir John Parsons, a distinguished Past-President of the Illuminating Engineering Society on attaining his eightieth birthday. Sir John is a Fellow of the Society and was President in 1922-24.

To mark the occasion Sir John was presented with his portrait in oils, the presentation being made by Sir Stewart Duke-Elder on behalf of the members of the Faculty of Ophthalmologists and the Ophthalmological Society. It is very fitting that Sir John's long and outstanding work in the field of ophthalmology should be recognised in this way for he has for very many years been acknowledged as the leader in all aspects of ophthalmology in this country. He has been adviser to many governments and industries on problems concerning vision, and many years ago he was responsible for interesting the Medical Research Council in ophthalmological problems with the results that are to-day well known.

Short Courses on Lighting

It is understood that the fifty-third Illumination Design Course to be arranged in London by the E.L.M.A. Lighting Service Bureau will begin on Monday, November 8, at 2, Savoy-hill, London, W.C.2, and that lectures will be given at 7 p.m. on that evening and on each Monday at that time up to December 13. The course includes lectures on lighting and vision, design, light sources, lighting and production and decoration. Those wishing to take part are advised to make early application to the Lighting Service Bureau.

A similar interesting series of lectures has been arranged to take place in Sheffield from October 20 to December 1, the lectures being given on consecutive Wednesday evenings at 6.30 in the Mappin Hall of the Department of Applied Science at the University of Sheffield, St. George's-square, Sheffield. This course has been arranged with the co-operation of the Department of Extramural Studies of the University.

Recent successful design courses arranged by the L.S.B. include two in Scotland at Kilmarnock and Dumfries where lectures were given by Messrs. C. J. King, A. D. S. Atkinson and D. A. Strachan.

A short course on *Colour and Lighting in Factories and on Machines* is announced by the Council of Industrial Design. The course, which has been arranged in conjunction with the British Colour Council, will take place at the Royal Institute of British Architects on November 24, 25 and 26. As there is an increasing demand on the part of industry for specialists in this type of work it is thought by the organisers that this course might be the means of making existing information more widely available. The course will, therefore, concentrate on the visual aspect of the subject and is intended mainly for architects, interior

designers, etc., though, no doubt, it will also be of interest to others professionally concerned with this subject. Further details of the course can be obtained from the Council of Industrial Design (Colour Course), Tilbury House, Petty France, London, S.W.1, on application by letter giving brief details of qualifications and interest in the subject.

I.E.S. Register of Lighting Engineers

We have been asked by the Illuminating Engineering Society to explain to I.E.S. members the reasons for the apparent delay in the consideration of applications for inclusion in the Register of Lighting Engineers. It would appear that some members who made application some months ago have not yet heard the result.

In the first place it might be explained that statements in support of each application have to be obtained from the supporters nominated by the applicant—a process which must inevitably take some little time. When applications are eventually complete with supporting statements they are submitted to the Registration Board.

It will be appreciated that with any scheme such as this it is essential that each application should be given very careful consideration before it is either accepted or rejected. Moreover, with an entirely new scheme the judging committee must be expected to start slowly whilst they familiarise themselves with the working of the scheme so that no injustice is done to applicants.

The duties of the Registration Board are, of course, not easy, and each member of the Board has a considerable responsibility towards I.E.S. members as a whole. Time spent in deliberations at this stage will be to the benefit of those who are eventually elected to the Register. No doubt as the scheme gets going the delay will be reduced.

I.E.S. Informal Meetings in London

During the 1947-48 session the I.E.S. introduced into the London programme two informal meetings which were additional to the normal series of sessional meetings. These meetings, which proved most successful, were arranged to give opportunities for the discussion of matters which could not normally form the subjects of papers at sessional meetings. It will also be recalled that discussion at these informal meetings is not reported in the formal way as is the custom at sessional meetings, thereby allowing those taking part a little more scope.

This session four such meetings have been arranged in London, the first being on December 8, when there will be a report and discussion on the recent Paris meeting of the International Commission on Illumination. This meeting will take place at Gas Industry House, 1, Grosvenor-place, near Hyde Park Corner, at 6 p.m.

The arrangement of the meeting is that Dr. S. English, who was leader of the British delegation in Paris, will give a short introduction after which Dr. W. D. Wright will deal with those subjects which might conveniently be grouped together under Photometry. Mr. J. G. Holmes will then deal with Light Sources (including diffusing materials and fittings), and Mr. R. O. Ackerley will cover the very wide field of Lighting Practice which includes the lighting of streets, schools, factories, etc. The last speaker will be Mr. L. G. Applebee, who will deal with Cinema and Stage Lighting. After each speaker there will be time for discussion on the section covered.

Considerable interest has been shown in the work of the International Commission recently. This meeting should, therefore, be a most interesting one.

Beyond Engineering

Summary of the Presidential Address delivered by Mr. J. M. Waldram on the occasion of his installation as President of the I.E.S., on October 12

In opening his address, Mr. Waldram said that he proposed to discuss some of the problems which, though generally classified as illuminating engineering, were not really problems of engineering. These were the problems of those who decided what they wanted to do with light once it had been produced and was under control; in fact, those who might be described as "lighting artists." Technicians and scientists had valuable contributions to make to illuminating engineering, but there were aspects of lighting which could not be measured and in which science must give way to art.

The Sensation of Light

It was appreciated at a very early stage in the history of illuminating engineering that there was more in lighting than just the engineering aspects of production and control, and that the final judge of lighting must be the user. This led to a study of physiological optics, embracing the eye and its properties, which has proved a great help to the colorimetrist and the photometrician. But, useful as these studies have been, it is still impossible to measure the "sensation" of sight. The photometrist can make use of the discernment of sensation and base his measurements upon it, but he cannot say how bright a light appears to be to someone else. Experiments to show what the eye can do have only shown what the eye just cannot do, e.g., the point at which details are too small to be seen (the threshold of acuity), or the point at which contrasts are just imperceptible. The lighting engineer is not, however, greatly concerned with these border-line cases, but unfortunately the physiological optician can tell him little about the conditions of seeing in which he is most interested.

The Artist

A practising lighting engineer, faced with a new lighting problem, tries to put himself in the position of the operator to find out exactly what the man or woman is doing and what part sight really plays in the operation. He also has to consider the question of brightnesses, a field in which much work is yet to be done.

But not all lighting is of a utilitarian nature, and in the decorative field the lighting engineer has enlisted the help of the artist to design lighting fittings. In this category might be included the architects, any of whom even now have a very slight acquaintance with what can be done with artificial light so that they are unable to contribute as they should to the work of the lighting engineer upon whom they are liable to lay restrictions based on architecture. Nevertheless, though lighting engineers and architects have far to go, they would seem to be making progress.

The ultimate result of the lighting is seen by the eye and is conveyed to the brain by a multitude of sensations, and is there perceived and interpreted. This perception of objects which we are enabled to see through the combination of lighting and eyesight, conjures up all kinds of associations, and it is this sense which the lighting artist must serve. It has sometimes been assumed that if our scientific knowledge was more nearly complete we should be able to understand and to tackle in a logical way all the problems of lighting. But in this field of understanding it is the artist who goes direct to the point and achieves a result by instinct in a domain in which the scientist is lost. The scientific problems of sight, i.e., street lighting, aviation lighting, etc., occur in the region in which the mechanics of perception are difficult and provide problems for the engineer and scientist, but as soon as seeing becomes an easy matter the problem has passed beyond engineering and it is the artist who must be consulted.

There are many branches of lighting in which the expert is not so much a lighting engineer as a lighting artist, but though in these fields the artistic instinct may be the first requirement, technical experience is required to carry out the artist's ideas. Seen in this way the field of illuminating engineering is a very broad one.

Forthcoming I.E.S. Meetings

(Provisional List)

MEETINGS AND VISITS IN LONDON

1948.

Nov. 9th. Sessional Meeting. DR. J. W. MITCHELL on **High Speed Photography.** (*At the Lighting Service Bureau, 2, Savoy Hill, W.C.2.*) **6 p.m.**

Nov. 23rd. Visit to Southampton Docks. (*Party will leave Waterloo Station at 9.30 a.m.*) (Ticket only.)

Dec. 8th. Informal Meeting. Report and discussion on the 1948 meeting of the International Commission on Illumination. (*At Gas Industry House, 1, Grosvenor Place, S.W.1.*) **6 p.m.**

Dec. 14th. Sessional Meeting. DR. J. N. ALDINGTON on **The Gas Arc—A New Light Source.** (*At the Lighting Service Bureau, 2, Savoy Hill, W.C.2.*) **6 p.m.**

MEETINGS OF CENTRES AND GROUPS

1948.

Nov. 1st. MR. W. T. SOUTER on **Church Lighting.** (*At the Medical Library, The University, Western Bank, Sheffield, 10.*) **6 p.m.**

Nov. 2nd. PROF. M. G. SAY on **Stage Illusion.** (Joint meeting with the British Drama League.) (*At the Lecture Theatre, British Electricity Authority's Showroom, Whitechapel, Liverpool, 1.*) **6.30 p.m.**

Nov. 3rd. MR. G. GRENFELL BAINES on **Illumination of Architecture.** (*At the Minor Durant Hall, Oxford Street, Newcastle upon Tyne.*) **6.15 p.m.**

Nov. 4th. A discussion on Lighting in the Home—The Future Plan. (Joint meeting with the Newport Branch of the E.A.W. and the Newport Townswomen's Guild.) (*At the Newport Town Hall Assembly Room.*) **3 p.m.**

Nov. 4th. MR. J. M. WALDRAM, **Presidential Address.** (*At the Demonstration Theatre, East Midlands Electricity Board, Charles Street, Leicester.*) **6.30 p.m.**

Nov. 4th. MR. J. ASSERSOHN, MR. L. GARDINER, MR. H. WILSON on **Decorative Design.** (*At Exeter.*)

1948.

Nov. 5th. MR. J. ASSERSOHN, MR. L. GARDINER, MR. H. WILSON on **Decorative Design.** (*At the South Western Electricity Board, Old Bridge, Bath.*)

Nov. 5th. Exhibition of Lighting Equipment. (*At the Midland Electricity Board's Lecture Theatre, Paradise Street, Birmingham.*) **6 p.m.**

Nov. 5th. MR. W. A. ALLEN on **Glare and Natural Lighting.** (*At the Electricity Showroom, Market Street, Huddersfield.*) **7.15 p.m.**

Nov. 5th. MR. J. M. WALDRAM, **Presidential Address.** (*At the Gas Dept. Demonstration Theatre, Parliament Street, Nottingham.*) **5.30 p.m.**

Nov. 8th. MR. T. CATTEN on **Lighting of the R.M.S. Queen Elizabeth and the s.s. Caronia.** (*At the No. 4 Sub Area Office, Yorkshire Electricity Board, Whitehall Road, Leeds, 1.*) **6 p.m.**

Nov. 11th. MR. W. D. SINCLAIR on **Fluorescent Street Lighting.** (Joint meeting with the A.P.L.E.) (*At the Reynolds Hall, Manchester College of Technology, Sackville Street, Manchester.*) **6 p.m.**

Nov. 17th. Address by the Chairman (MR. N. HUNTER). (*At the Cleveland Scientific and Technical Institution, Corporation Road, Middlesbrough.*) **6.15 p.m.**

Nov. 19th. MR. C. J. KING on **Psychology of Good Lighting.** (*At the Heriot-Watt College, Chambers Street, Edinburgh.*) **6.30 p.m.**

Nov. 25th. DR. J. W. MITCHELL on **High Speed Photography.** (*At the Institution of Engineers and Shipbuilders in Scotland, 39, Elmbank Crescent, Glasgow, C.2.*) **6.0 p.m.**

Nov. 25th. MR. A. WILCOCK on **Lighting of Recreational Centres.** (*At the No. 1 Sub Area Office of the Yorkshire Electricity Board, 45–53, Sunbridge Road, Bradford.*) **7.30 p.m.**

Dec. 1st. MR. W. A. DODGSON on **Some Unusual Lighting Installations.** (*At the Minor Durant Hall, Oxford Street, Newcastle upon Tyne.*) **6.15 p.m.**

Dec. 2nd. MR. W. H. WILLOTT on **Glass in Projection Systems.** (*At Exeter.*)

Dec. 3rd. MR. W. A. R. STOYLE on **Maintenance of Fluorescent Lamps and Auxiliary Gear.** (Joint meeting with the E.C.A. and A.S.E.E.) (*At the Imperial Hotel, Temple Street, Birmingham.*) **6 p.m.**

(Secretaries of Centres and Groups are requested to send in particulars of any changes in programmes, mentioning subject, author, place, date and time of meeting: summaries of proceedings at meetings (which should not exceed about 250–500 words) and any other local news are also welcome.)

A.P.L.E. Annual Conference

The following is an account of the Annual Conference of the Association of Public Lighting Engineers, held at Eastbourne, during September 13th to 17th.

The large attendance, more than 1,000, at the annual Conference of the Association of Public Lighting Engineers, which was held in Eastbourne from September 13 to 17, and the nature of the papers and discussions, again demonstrated the increasing interest being taken in improving the standard of street lighting. There was also brought into prominence problems which the improvement in street lighting itself has brought into existence affecting other aspects of public life, which call for the greatest co-operation between all concerned.

Opening Proceedings

The proceedings of the Conference opened in the Winter Garden at Eastbourne on Monday, September 13, when the retiring President, Mr. T. Wilkie, of Leicester, presided at the annual general meeting. After a civic welcome had been extended to the members and delegates by the Mayor of Eastbourne (Councillor E. Richards, J.P.) Mr. Wilkie inducted his successor, Mr. Norman Boydell, who was formerly Borough Electrical Engineer, Eastbourne, and is now manager, East Sussex and South West Kent, South-Eastern Electricity Board.

At the annual general meeting, the President referred with sorrow to the death, since last year's meeting, of the Secretary of the Association, Mr. H. O. Davies, after a short illness and paid a tribute to the work he had done for the Association. He also referred to the death of Mr. J. S. Dow, who had been Hon. Secretary of the Illuminating Engineering Society for many years, and President during 1946-47. Mr. Dow was also for four years Secretary of the Association of Public Lighting Engineers, and had always shown a great interest in the affairs of the Association. The Illuminating Engineering Society and the Association of Public Lighting Engineers had never in any sense been competitors; they had the same ends in view, but approached them from different angles.

Reference was then made to the loss sustained by the deaths of Mr. A. Forbes of Aberdeen, one of the original members of the Association and President in 1934, and also Sir Clifford Paterson, chief of the General Electric Company's Research Laboratories, the staff of which had been staunch supporters of the Association.

The accounts having been presented and adopted, it was announced that Messrs. R. Parker, H. Pryce Jones, and C. C. Smith had been elected members of the Council. Mr. W. N. C. Clinch retired under the Articles of Association, and Mr. H. V. Emptage, although eligible for re-election did not wish to stand owing to impending retirement from his official position.

It was also announced that the Council had given great thought to the question of a successor to Mr. Davies and had unanimously appointed Mr. Eric Evans, who had served with Mr. Davies for many years.

The meeting closed with a cordial vote of thanks to Mr. Wilkie for his services as President.

The Mayor of Eastbourne (Councillor R. E. Richards) then extended a civic welcome to the Conference, and said that although he had welcomed one or two engineering conferences to Eastbourne this year, it was a special pleasure on this occasion because the incoming President was Mr. Boydell, who was in charge of the local supply of electricity, and an authority on lighting.

The President thanked the Mayor for his warm welcome and then formally introduced his successor, Mr. Boydell. Mr. Boydell, on taking the Chair, presented the Presidential certificate and badge to Mr. Wilkie, drawing special

attention to the fact that the badge bore the dates of two periods of office, 1930 and 1947, no other President having served two periods.

The Mayor, accompanied by the President and Council, then formally opened the exhibition. There were 46 stands in the exhibition, and in the grounds of the Winter Garden there was a fine display of lamp columns, tower wagons, etc.

Presidential Address

The President delivered his address on the Tuesday morning, and reviewed the progress of public lighting since 1924, when the Association was formed. Since that time, when public lighting was a very haphazard affair, he said the Association had been recognised by Government departments, and town and city councils, and had been rapidly increasing its membership. He called attention to the formation of two local centres, one in Lancashire and one in Scotland, and pointed out that the membership includes members in the Dominions and foreign countries.

He emphasised that the chief function of the Association is to educate the public in general, and the lighting authorities in particular, with regard to the necessity and value of good street lighting, and then went on to discuss the question of cost and how the money for good street lighting might be provided. He drew attention to the great financial and other loss to the community due to road accidents, a contributory factor to which was inefficient street lighting, estimating that the figure at the present time was about £100,000,000 a year. This he contrasted with the figure of £3,500,000 which the Ministry of Transport Departmental Committee had estimated would be the annual cost of lighting all classified roads in county boroughs, and 20 per cent. of those in counties, to the standard the Committee recommended. It would appear, therefore, that adequate street lighting could be provided at a cost very much less than the cost of accidents it was calculated to save.

Mention was also made of the relation of poor street lighting to the incidence of crime, and commenting on the restriction of street lighting to 75 per cent. of pre-war, he said it was surprising how so few people realised how comparatively little fuel was used by street lighting and that, as an example, quite a long street could be well lighted for less energy than was used by one electric fire.

The lack of uniformity of lighting as between neighbouring areas was also strongly emphasised, and the need for maximum co-operation between lighting engineers and town planners and others responsible for the planning, contruction, and maintenance of our roads was stressed.

Remarking that the standard of light distribution was very high, he paid a tribute to the associates of the Association—representing the manufacturers—for the great progress in technique, particularly with regard to fittings, that had taken place during the lifetime of the Association. These manufacturers included some of the largest firms in the country who had never ceased to give street lighting an important place in their research and manufacturing organisations, in fact some of their ablest men had devoted themselves to this work.

Speaking of the future, he said that the technique of street lighting in this country would continue to advance from its present high standard, which, despite administrative difficulties, was second to none at the present time. The latest technique in the application of fluorescent lamps to street lighting was bound to expand generally, and authorities would probably follow the fine example set by recent installations, in regard to which an American lighting specialist recently said they had nothing to compare in the United States. Would even this technique, however, be superseded by one in which the roads and pavements were lighted from strips and panels set in the façades of buildings? The future held infinite possibilities of this kind. Centralised remote control was an obvious step in due course in order to provide simultaneous switching and flexibility of operation.

We had a long way to go in this country, he said, with regard to the daylight appearance of installations. The U.S.A. was very far ahead of us in this direction, and in Paris they were most concerned with aesthetic values. On the Pont du Carrousél there were columns which, by daylight, were only 14 metres high so as not to spoil the aesthetic views in the neighbourhood, but at dusk the columns were extended, telescopic

fashion, until they were 21 metres high, in order to provide better light distribution.

He welcomed at the Conference representatives of the new British Electricity Authority and of the Area Electricity Boards and also representatives of the gas industry, and emphasised that the Association affords the only common ground on which street lighting problems can be discussed.

On the motion of Mr. A. S. Tapsfield (vice-president), a cordial vote of thanks was given the President for his Address.

Unidirectional Lighting

Following the presidential address, a paper on "Unidirectional Lighting of Double Carriageways and One-way Roads," was read by Mr. J. S. Smyth of the General Electric Research Laboratories.

The author pointed out that in the Departmental Report on Street Lighting of the Ministry of Transport it was tentatively recommended that each track of a double carriageway should be lighted independently and in the usual manner. It was also pointed out in the report, however, that there was need for considerable investigation into the problem, in particular "by appropriate modification of the distribution in two directions along the axis of the road."

The unidirectional system is an attempt to improve the lighting by such a modification and, it was added, the incidental reduction in the power required for a given standard of revealing power was of special interest at a time when power restrictions were hampering the public lighting engineer.

The author urged that unidirectional lighting, being a new approach to the lighting of double carriageways, should be judged on its own merits and not only in the light of previous practice. The light output per 100 ft. of road was only some 2,000 lumens with 125-watt H.P.M.V. lamps spaced 150 ft. apart. This, of course, was less than the recommended minimum of 3,000 lumens suggested in the Departmental Report, yet the road brightness could be as high as that normally obtained with an output of 8,000 lumens, while revealing power was enhanced by a reduction in the brightness of light coloured objects. It seemed clear, therefore, that while more experience was required before a final assessment could be made, it would be wrong to doubt the efficacy of the system merely because the power consumption is low.

The advantages claimed for the system are:—(1) The contrast between objects on the road and the road surfaced is enhanced; (2) the second carriageway appears to a driver to be unlighted and he is not troubled by glare and distraction due to lamps on other carriageways; and (3) the clearness with which road junctions can be seen.

It is claimed that the glare from the lanterns is similar to that generally associated with a good non-cut-off installation, if the usual spacing of 150 ft. staggered is used.

Before the war, the only installation erected was an experimental one on the Great Chertsey-road, but it suffered from some handicaps. Recently, however, several schemes planned according to accepted methods have been put into service. It has been found that the system operates as expected and no unforeseen disadvantages have been detected. The longest stretch is on the Bradford road near Huddersfield, and although the system has not yet been in service long enough to merit a final judgment, comments so far have been appreciative.

Another unidirectional installation is at Portsmouth, and here experiments have been carried out with 45-watt sodium lamps, the lowest power yet considered for traffic route lighting. The general installation, however, is 125-watt H.P.M.V. lamps in lanterns spaced at 120 ft., similar to the Huddersfield installation.

In the discussion, the comments, on the whole, were favourable and a number of questions were put. Some fear was expressed that glare might be considerable, and it was asked what would be done when one of the two roads of a dual carriageway was under repair and one road had to be used for both lines of traffic temporarily. The difficulty of background in the case of roundabouts was mentioned, and it was urged that designers of roundabouts and lighting engineers should get together on this matter. It was appreciated by those taking part in the discussion, however, that this work was still in the experimental stage.

From the gas industry came a tribute that this method of lighting, in the case

of carefully selected roads, would be a solution of some problems. A question was put whether the system had been used in one-way streets but the author said it had not.

Lighting in the Vicinity of Aerodromes

On the afternoon of September 14, a paper on "Street Lighting in the Vicinity of Aerodromes" was presented by Dr. S. English and Mr. J. G. Holmes. of Holophane, Ltd.

This paper was written around the Air Navigation Act, 1920, and the Air Navigation Order, 1923, which include provisions requiring that:

> (a) Any light exhibited in the vicinity of an aerodrome which, by reason of glare, is likely ao endanger aircraft arriving at or departing from the aerodrome, and
>
> (b) Any light which is liable to be mistaken by the crew of an aircraft for an aerial lighthouse or for a light or part of a system of lights used for air navigation,

shall be extinguished or effectively screened on the direction of the Secretary of State or the Minister of Civil Aviation.

The present scheme of administration is that the Ministry of Transport sees all proposed street lighting schemes and, before giving approval, the schemes are passed to the Ministry of Civil Aviation which, in turn, passes them to the Air Ministry or Admiralty, if they are related in any way with military or naval aerodromes. Lighting within half a mile from the runway in any direction and within two miles of the end of a runway, measured along the length of the runway, or within three miles of the end of the runway for instrument controlled landings, comes within the scope of the powers granted to the Ministry of Civil Aviation and they may require dangerous lights to be extinguished.

The authors were very sympathetic to the needs of aircraft in regard to street lighting and showed some lantern slides of a part of London taken on a clear night, which showed an enormous number of lights of various forms which, admittedly, must be most distracting to the pilot of an aircraft about to land.

In the paper is described a number of new designs of cut-off lanterns designed to meet the regulations mentioned above. The authors point out that the requirement that lanterns should have a horizontal cut-off or a closely controlled cut-off had been shown to be quite reasonable from the point of view of the safety of air transport. It introduced complications in street lighting which provided difficulties for public lighting engineers which, however, were not insurmountable. The principal problem was that of the additional cost which was incurred in a cut-off lighting scheme, because though the lanterns themselves might not be more expensive than the more usual type of lantern, it was generally necessary to reduce the spacing to 100 ft. or less.

However, if the economic problems could be solved, the authors see no reason why lighting installations should not be perfectly satisfactory, both as seen from the air and from the ground.

There was not much discussion on the paper, the chief concern being who was to pay for the extra cost involved in the type of lighting imposed by the Regulations. It was felt that the Government Departments concerned would have to take this matter into consideration with the local authorities. For instance, at Liverpool it was stated that columns only 8 ft. high, spaced at about 25 ft., had been found necessary to comply with the regulations.

Attention was called to the use of radio devices for guiding aircraft, and it was thought that these should be sufficient without undue interference with the street lighting in the vicinity of aerodromes. On this point Dr. English said that radio devices brought the pilot very nearly on to the runway, but that for the last few seconds he had to rely on visual aids.

Another suggestion was that there should be special colours used for street lamps as compared with those for aerodromes, but Dr. English said there were hardly sufficient colours to go round now, and the aviation authorities already required more. Only certain colours were easily distinguishable, and the aviation authorities could not very well be told they must not use, say, white light because it was required for street lighting.

Since the discussion, a communication has been received from the Ministry of Civil Aviation in which the general proposition was stated and the view expressed that consideration should be given to the problem of screening street

lighting with as little additional cost as possible for existing installations and with no additional cost for new installations. Research should be directed to the possibility of designing a street lighting fitting having both a satisfactory cut-off above the horizontal and giving adequate illumination on the ground, and at the same spacing as for non-cut-off lanterns. It was agreed that the problem of cost was of considerable importance, but it was pointed out that statutory authority existed for enforcing the screening of confusing or dangerous street lights in the vicinity of aerodromes.

Basic Principles

On Wednesday morning, September 15, Mr. David M. Thompson gave a general paper on "The Basic Principles in the Design of Street Lighting Installations and their Practical Application."

The paper was not, and was not intended to be, highly technical, and the author confessed that no new facts were expounded. He based the paper on the requirements defined in the final report of the Ministry of Transport Departmental Committee and the draft specification which was circulated three years ago. Remarking that a code of practice for street lighting is now in course of preparation to replace the specification, he said it was unlikely that the basic requirements would be much altered.

Again the question of cost obtruded itself, and the author said there would be no great difficulty in lighting streets or roads but for the matter of cost. If we could use sufficient light sources of ample power, so that illumination intensities comparable to those used indoors were obtained, then the problem would be relatively simple. The cost, however, would be exorbitant, and, at the present time, the consumption of gas and electricity would be, to put it mildly, discouraged.

The paper discussed road surface brightness and silhouette vision, areas of brightness, and types of street lighting installations, and, finally, the selection of an installation to suit the road. He showed illustrations of various types of road, dividing traffic routes into 10 different varieties, and indicated the spacing, etc., for each, as modifications of the recommendations in the Departmental Committee's Report for Group A lighting. In the same way, he said, there can be many types of Group B lighting, and finally expressed the view that a third group would be helpful with a mounting height of about 20 ft. This, he said, would meet the requirements of many roads where Group A lighting was not justified, but which required rather better lighting than Group B.

In his conclusion, he said that all the points considered applied equally whether gas or electricity was used, but added, as a member of the gas industry, that gas lighting could provide excellent installations whether for Group A or Group B. New types of lanterns had recently been introduced of greater efficiency and improved appearance. Expressing the hope that the paper clarified ideas regarding good design, he said that once the reasons were clearly understood the design of an installation became much simpler and there was less necessity to work according to rule.

In an appendix to the paper, the specified requirements of a street lighting installation were stated and explanations were given of the factors so as to clarify the principles of design.

There was a good discussion on this paper with some suggestions being made which savoured of the ideal in some cases and were, perhaps, a little futuristic in others. For instance, Mr. G. G. Baines, an architect and planning consultant, mooted the idea of using captive balloons for carrying lamps for street lighting, the balloons being lowered during the daytime. A hint was also given that in some areas the main lighting might be that from motor car headlights.

The influence of the road surface on street lighting was referred to by Mr. R. S. Bradley (Southern Electricity Service), and he asked for a road which was just as good from the reflectivity point of view in bad weather as in good. He said he had seen one promising experimental road in this respect in Portsmouth, which he thought was a little better from the lighting point of view in wet weather than in dry. He also gave a warning against false economy when purchasing street lighting equipment.

Mr. E. Stroud advocated cut-off lighting and maintained that if all factors were taken into consideration it would be found to be little, if any, more expensive than the non-cut-off type. Indeed, he claimed that the cut-off type of

lighting gave the most comfortable vision and the least expensive installation when everything was taken into consideration.

Monsieur L. Gaymard, who is in charge of the street lighting of Paris and is president of the French I.E.S., speaking in excellent English, referred to the growing preference in France for the cut-off type of lighting, but spoke with some sadness of the necessity for reducing the lighting in Paris and elsewhere in France due to the stringent economic conditions. Gas lighting was not being encouraged in France, and both there and in Switzerland it had been decided that all future installations should be electric. Finally, he mentioned some very fine installations of street lighting in Geneva which he said were well worth a visit.

Mr. J. M. Waldram (G.E.C. Research Laboratories) spoke of early experiments with the non-cut-off or semi-cut-off type of lighting in streets, and of the success that could be obtained from the point of view of glare and building up the brightness on the road surface if the peak candle-power was in a certain direction just a little below the horizontal.

Some speakers thought that cost should not be allowed to prejudice a good installation, and several comments were made that the use of motor car headlights should be prohibited in certain streets, otherwise all the advantages of a non-glare effect from a cut-off system would be lost.

The author was congratulated by Mr. F. C. Smith on making a new approach to street lighting in advising councillors and lighting engineers to examine the aesthetics of their towns and decide which characteristics it was desired to retain. Then they would be able to design a suitable installation. Hitherto the method of approach had been that a few manufacturers put up some street lamps which were inspected by members of the Council, and a decision made solely from the point of view of a certain distribution.

Light Sources

"One Hundred Years of Research and Development in Electric Light" was the title of the paper read on Thursday morning, September 16, by Dr. J. N. Aldington (Siemens Electric Lamps and Supplies, Ltd.).

The title sufficiently indicates the scope of the paper, which forms an excellent work of reference. The author traversed the developments from the earliest carbon filament lamp to the latest gas arc, and credit was given to electric lamp research organisations for the fact that the last two decades have seen the most rapid advances yet made.

The discussion was wholely of a complimentary character. The view was expressed that when restrictions are removed the fluorescent lamp will find its way more and more into public lighting, and the possibility of lamp columns as high as 50 feet was foreshadowed.

Again the question of cost was mentioned, but it was urged there should not be too much complaint on the score that modern high efficiency installations cost a little more money than did the older ones.

It was asked why fluorescent tubes were always straight, the view being that curved tubes would present possibilities for artistic presentation. On this point the author said the need of the country at present was production, and it had been decided that for the present, and he hoped for some time to come, the fluorescent lamp in this country would continue to be straight.

Safety First

The final paper of the Conference was presented on Friday morning, September 17. The author was Mr. Charles N. Melton (Street Lighting Inspector to the Dagenham Borough Council), and his subject was "Safety First on the Highways, with Special Reference to Public Lighting."

Here, again, a good deal of familiar ground was traversed, but a sound reason for such a paper is, as the author pointed out, that the matter is urgent, as road traffic is once more gradually on the increase. Thus again there was discussion of the problems associated with glare, lack of uniformity in lighting, the use of safe equipment, aids and hindrances to visibility, lighting of traffic signs, pedestrian crossings and the maintenance of street lighting installations, with, generally speaking, a recapitulation of fairly well-known principles. A plea was made for a reduction in the large number of types of street lighting equipment now available.

Various suggestions were made by the author. For instance, in regard to the lighting of traffic signs, it was thought

that a more rigid control of this class of lighting is required and that it could be obtained by the issue of a British Standard Specification to cover both mandatory sign fittings and illuminated guard posts.

Another suggestion was that some special lighting of pedestrian crossings, apart from the general street lighting, would be valuable, but a speaker in the discussion pointed to possible dangers if this were done.

Broadly speaking the paper emphasised what has so often been said before—and it well bears reiteration—that street lighting is rapidly becoming more of a science and less of an art, and that a satisfactory solution can only be obtained by careful planning and a consideration of the characteristics of the particular area, features which cannot be definitely fixed by the necessarily dogmatic assertions of a specification.

A view of the G.E.C. stand.

The paper gave rise to some discussion, although there were not many matters on which there was disagreement with the author. Many points discussed in connection with previous papers at the Conference, e.g., the need for careful planting of trees, greater attention to uniformity of lighting as between neighbouring authorities, co-operation between the road engineer and the lighting engineer, the possibilities of a third group of roads, etc., were again mentioned.

Mr. J. M. Waldram said that at the recent meeting of the International Commission in Paris an appreciable amount of time was given to the consideration of accidents and their relation to street lighting. As regards glare it was difficult to get a definite numerical estimate of the reduction of visibility caused by glare and, generally, when one tried to find what reduction in accidents would occur with certain changes in the lighting one was up against considerable difficulties.

Open Forum

After the conclusion of the discussions on the papers there was an Open Forum at which matters which the members wished the Council to consider were brought forward although no comment on them was made by the President. Points raised will, it is understood, be considered by the Council of the A.P.L.E. in due course.

A request was made that there should be more local centres. At present there are only two—one in Lancashire and one in Scotland—and representatives from the South expressed their willingness to take an active part in forming such a centre, the view being expressed that one opportunity a year for lighting engineers to meet and discuss their problems, i.e., the annual conference, was not sufficient.

The rating of fluorescent and discharge lamps was mentioned and the complaint made that they were rated on the watts consumption of the lamp and not on the lamp plus the choke and any other associated equipment.

As regards uniformity of illumination, one delegate urged care in dealing with this problem, and said he would be very loth to agree to bring his lighting into conformity with that of a neighbouring borough which he did not regard as being as well lighted as his own. The same delegate criticised the design of lamp columns, remarking that there was not yet one in which the column and the lamp was designed as a single unit.

It was further recommended that

steps should be taken to prohibit the use of motor-car headlights in certain classes of streets.

Annual Luncheon

There was a company of some 250 members and guests at the annual luncheon which was held at the Grand Hotel, Eastbourne, on Wednesday, September 15. The Rt. Hon. Viscount Falmouth proposed the toast of "The Association of Public Lighting Engineers" and the response to the toast of "The Guests" was made by Mr. J. R. W. Alexander, of the British Gas Council.

The Exhibition

In the exhibition of street lighting equipment which was organised in connection with the Conference, lamps and fittings for both main and side roads were on show, as well as other items of equipment such as tower ladders, lamp columns, signposts, etc.

The British Gas Council stand was in the nature of an information bureau, staffed by experienced street lighting engineers. A feature of the stand was a specially constructed model demonstrating Class "A" and Class "B" roads, on which any lighting arrangement could be shown.

Manufacturers of gas street lighting equipment who exhibited were William Edgar and Son, Ltd., the Horstmann Gear Co., Ltd., Metropolitan Gas Meters, Ltd., Willey and Co., Ltd., William Sugg and Co., Ltd., Parkinson and Cowan (Gas Meters) Ltd.

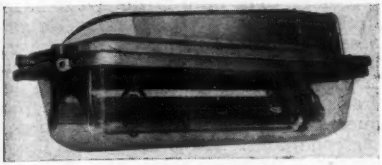
The "Mazdalux" fluorescent street lighting lantern was a feature of the British Thomson-Houston Co.'s exhibit. First seen by delegates at the A.P.L.E. conference, in 1946, this lantern has undergone a number of subsequent improvements in design and mechanical construction.

Other lanterns intended for the lighting of Group "A" roads were the stylised range (Series 600) of "Mazdalux" side-entry lanterns for use with mercury vapour and gasfilled lamps, and the horizontal open and horizontal enclosed lanterns for use with 45/140 sodium vapour lamps. The Series 600 is designed to meet the demand for a complete range of side-entry lanterns accommodating every size of vertically-operated mercury vapour and gasfilled lamp, and applicable to every type of location so that lanterns of uniform appearance can be installed throughout a town.

A view of the B.T.-H. stand.

On the General Electric Company's stand a new open type lantern for side streets, designed to take most small wattage lamps up to 200 watts, was shown. This new fitting has a sloping side-entry mounting, so that it can readily replace existing G.E.C. "Facet" two-way directional lanterns when three or four-way distribution is required, the new type then being provided with a dome refractor to give a symmetrical light distribution. In general, the lantern is designed for use with 60 to 200-watt filament, or 80 to 125-watt H.P.M.V. lamps. The form of construction—die castings of light alloy—follows the characteristic G.E.C. practice.

Amongst the remaining G.E.C. street lighting



The "Mazdalux" sodium enclosed lantern.

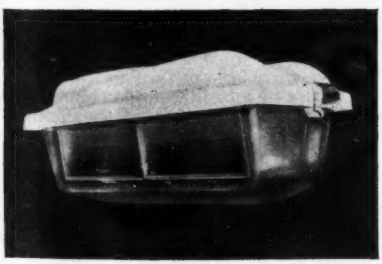
exhibits were two small lanterns of modern design for the new Osram 2 ft. 40-watt fluorescent lamps, suitable for erection in residential areas or on housing estates. One type accommodates four lamps, burning vertically, enclosed in an opal "Perspex" cylinder, while the two lamps in the second lantern are horizontal, the light control being obtained by curved reflectors behind the lamps.

The star exhibit of the Metropolitan-Vickers Electrical Co., Ltd., was their new "S.O. Fifty" lantern, which is probably the first all-"Perspex" totally enclosed refractor street lighting lantern. It is of modern design, accommodating either an 85-watt or a 140-watt sodium discharge lamp.

The hood, which is shaped from 3-16 in. thick dense opal "Perspex," is supported, and the lantern fixed to the lighting column, by a two-part rib in cast aluminium alloy, which also carries the lamp and lampholder assemblies.

Hinged from the rib by a stainless steel wire ring is a bowl shaped from 3-16 in. thick clear "Perspex" to the sides of which specially designed refractors of the same material are sealed. The lantern is weatherproof when the bowl is retained in its "closed" position by a stainless steel toggle.

High optical performance is claimed for this lantern, and the small amount of light, about 8 per cent. diffusely transmitted by the hood gives it a very attractive appearance when the lamp is burning.

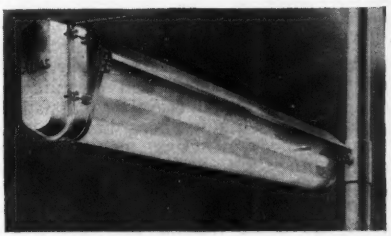


The Metrovick "S.O. Fifty" lantern.

The lantern is also said to be easy to erect, its weight being only 17½ lb. Being made of "Perspex," it is said to be free of corrosion, and maintenance, which consists of cleaning with soap and water, is reduced by the smooth exterior of the lantern.

The Revo Electric Co., Ltd., in addition to other equipment, showed a new lantern for use with two 20-watt 2-ft. fluorescent lamps for side-street lighting. They also showed a range of artificial stone standards which have been approved by the Royal Fine Art Commission.

The central feature of the Philips Electrical, Ltd., stand was a display of fluorescent, sodium, mercury, and mercury-fluorescent lamps and apparatus for public lighting. Included in this display was the Philips blended lighting lamp, which is supplied in 160-watt and 250-watt ratings. These lamps require no apparatus, as the tungsten filament component acts as a resistance ballast, and they can therefore be used to replace lamps in existing tungsten fittings to improve the quantity and quality of the light.



The "Atlas" fluorescent street lighting lantern.

Thorn Electrical Industries, Ltd., showed the "Atlas" fluorescent street-lighting unit, designed for mounting at 25 ft. for main road lighting. This unit uses three 80-watt fluorescent lamps.

Other exhibitors of lamps and lighting fittings were the Brighton Lighting and Electrical Engineering Co., Ltd., the Electric Street Lighting Apparatus Co., the Engineering and Lighting Equipment Co., Ltd., Gowshall, Ltd., Holophane, Ltd., Siemens Electric Lamps and Supplies, Ltd., Simplex Electric Co., Ltd.

A Colour Policy for the Factory

By R. NAGEL

Much has been said about colour during the past few years, and especially about its application to industrial interiors. In the same way as they have become lighting conscious, industrialists are now awakening to the opportunities offered to them by the use of colour in their factories. However, many painting schemes are being designed which do not always satisfy requirements of good lighting practice. For industrial colouring requires as careful planning as does good lighting, and many important factors are often overlooked.

It has been proved beyond all doubt that modern factory painting, apart from improving appearance and cleanliness, can step up production by assisting vision, improving workers' morale, and reducing accident risks. These points are identical with those put forward by lighting engineers in favour of better lighting, the reason being that they concern the same human factors. Good painting, as good lighting, has a combined physiological and psychological effect which is an important factor in modern production.

The well-known experiment of trying to see black cotton on a black cloth then replacing the black cotton by a white one has analogies in many industrial premises, especially machine shops where the conditions pertaining are in terms of grey—grey steel objects being manufactured on grey painted machines with moving parts of grey burnished steel, so that it is difficult to distinguish the work from the machine.

More often than necessary the worker lifts his eyes to a drab wall colour which affords them no relief, or to a white-washed surface which causes the pupils to contract and receive insufficient light momentarily when again focused on the less luminous work. Similar conditions are often encountered in the textile industry where white-washed walls offer little contrast to the threads, reels, and rolls of cotton, undyed wool and linen used in spinning, weaving and other processes. The need of the eye to adapt itself continually to varying brightnesses leads to fatigue, and has a very bad psychological effect upon the operatives. In these circumstances an increase of lighting level would not produce the expected improvement in seeing conditions. If too much local illumination is provided there may be excess brightness contrast between the task and the surroundings.

These considerations indicate the following line of approach in "colour planning":—

(a) The task and its immediate surroundings must be considered and suitable colour contrasts provided to divorce visually the critical machine area from the material fabricated.

(b) Colour must also differentiate between critical and non-critical parts, or concentrate attention on the critical area by use of lighter colours or those which most readily attract the gaze.

(c) Colour must then be applied to the general surroundings after giving consideration to such factors as illumination, maintenance, personal preference, etc.

But in this work vivid colours and excessive contrasts must be avoided. Distracting colours in the worker's field of vision can exercise a bad effect on the entire colour scheme.

Machinery and Focal Area

The first step in industrial colour planning is the study of the task background and its immediate surroundings; that is the focal area. The focal colour must be chosen carefully to provide a suitable contrast in hue with the task and ensure the maximum reflection of light on the work.

The reflection factor of focal colours for critical areas of machinery or equipment should be about 60 per cent. Focal colours should be selected from among those in the middle of the spectrum as the eye is most sensitive to this colour range.

The use of a background colour nearly complementary to that of the material being worked is an ideal solution for hue contrast. Purple, blue-purple, orange-red, and red, in too great purity or in too large an area, however, have harmful psychological effects when viewed for any length of time. The colours of the middle of the spectrum, yellow and yellow-green, aid visual

acuity, speed of discrimination, and ability to sustain clear seeing.

The second step in industrial colour planning is to choose the machinery body colour which must provide suitable contrast of brightness with the task and its immediate surroundings. The working area must be the brightest part in the field of vision, as the eye, being naturally attracted by the brightest spot, would wander unnecessarily if the whole machine were painted a light colour.

The body colour should not have too low a brightness value as the brightness contrast with the working zone would be too great, and the cheerfulness of the general colour scheme would be lowered. Machine body colours should have reflection factors of about 25 to 35 per cent. These values are at least three times those of the drab machinery colours—grey or olive green —which are generally used, and whilst still providing suitable value and hue contrasts with the focal area, do not present too much maintenance difficulty.

Workers prefer to see the body or static parts of machines and the moving parts separated by colour contrasts, and so both for technical and psychological reasons this separation is necessary.

General Surroundings

Once the critical area and body colours are selected the general surroundings must be allocated colours that answer to various conditions of room dimensions, temperature, maintenance facilities, etc. Some colours make a room appear to be larger than it actually is, whilst others make it appear smaller; by using these "receding" or "advancing" colours in the proper way on walls or ceiling, a room can be made apparently longer, shorter, higher, or lower.

Wall colours should have reflection factors of at least 50 per cent. Colour on ceilings must be used with care. Normally, when good light reflection is needed, white ceilings are best, but coloured ceilings, particularly in greens and blues (receding), if they are high enough, will help to camouflage unaesthetic pipes and beams and give an impression of "out of doors." Low coloured ceilings emphasise pipes, girders, etc., and distract attention from the work in hand.

The question of maintenance, where soiling of lower walls is inevitable, will often demand the use of a dado. Here again the size of the room must be considered, since remote walls will not run so great a risk of becoming dirty. In any case, walls should be washed at regular intervals to maintain the efficiency of the colour scheme. The reflection factor of dado colours should be at least 25 per cent.

Women's preferences differ slightly from those of men. Greens, blues, and browns please men, whilst women prefer delicate colours such as turquoise or peach.

Safety Code

Lastly comes the application of the Safety Colour Code. The colours used for this purpose must be strong to evoke quick reactions. They must conform to the accepted rules of colour associations, be restricted to their correct usage and appropriate areas, and positioned with the greatest care. No strong colour, however, should be applied to equipment immediately in the line of vision of the operator at his work, as such colour would distract his attention. One single colour spot wrongly positioned would nullify the benefits of visual comfort and increased ease of operation brought about by the remainder of the colour scheme.

Among the various safety colours orange, red, and yellow are the most important. It has been shown that the best danger-warning colour is orange, which should be used on danger points normally covered by lids, covers, or guards. In this way the colour shouts "Danger" as soon as the protecting lid or guard is removed. Although opposite to the now out-dated custom of painting guards and covers in red to denote danger, this system is logically safer, for the need for greater caution is when the dangerous machinery parts are exposed by the removal of the guards or covers. Moreover, the painting of large areas such as guards, covers, or lids in arresting colours causes irritability and distracts attention from the work in hand.

The excessive and incorrect use of orange dulls its strident warning note. Red should be used only to indicate fire protection equipment, and thus promote automatic prompt action in case of fire. Yellow used with black offers the best contrasting combination for high visibility and demands attention. Alternate stripes of yellow and black should be

painted on protruding parts, posts, chain hoist blocks, low beams, rails, trucks, etc., which might constitute danger to unwary walkers.

The Effect of Lighting

The usual types of lighting, incandescent and fluorescent, do not reproduce daylight exactly. Among the more important factors that influence the transformation of appearances under artificial light are the pigmentation or colour of the paint or object, the colour of the artificial light by which it is seen and the contrasting colours of surrounding areas and objects. Cool light produced by "daylight" units is suitable for use with blue, blue-green, and green. Colours in the red-orange range, vermilion, orange, coral and peach, are unsuitable for use under the "daylight" units. "Warm white" lighting is most adaptable to rooms in which such colours as ivory, cream, peach, beige, coral, rose or tan are used. Very often when fluorescent lighting is installed little consideration is given to the colour of walls, or of equipment and material handled, with the result that they are unnecessarily distorted. Furthermore, regard is seldom given to the fact that the tubes themselves are either pink or blue and may produce ambiguities with the surrounding colours.

It is often easier to adapt the paint to the light, rather than the light to the paint, as greater variety can be obtained in paint colour than in light. Effort should be made, however, to make the paint colour brighter rather than duller; for instance, a colour of paint complementary to that of the light, as blue paint with incandescent light, or pink paint with "daylight" fluorescent tubes, is objectionable. (See "The Editor Replies," *Light and Lighting*, June, 1948.)

Maintenance

In the past the most frequent argument against modern colour planning was the question of maintenance. Now it is found that a very dirty, bright-coloured surface reflects more light than a clean, dark one, and bright colours encourage better housekeeping, thus producing a cleaner and more attractive factory. This fact alone makes colour planning worth while. Visitors to a factory are impressed by appearances and acknowledge cleanliness as a sign of efficiency.

Study and experience have shown that operators keep their machine, or at least the critical area, clean of their own accord, as they are convinced of the benefits of the method. It is a fact also that good maintenance is encouraged, as defects resulting in oil leakage are more readily apparent.

Light dados or absence of dados is a matter for individual consideration, their use depending upon the risk of soiling, proximity of machines and equipment, and the width of traffic zones; once a trolley has been run into a wall the disfigurement is just as bad whether a dado is present or not.

Conclusion

Improvements in safety, workers' efficiency and morale are the main advantages of the correct use of colour in factories.

With the encouragements given by the Government towards modernisation of factories and the growing interest in colour planning, one can feel certain that in a few years' time no factory will be called modern until it has adopted a proper colour policy.

Lighting in Schools

A British Standard Code of Practice entitled "Provision of Electric Lighting in Schools" (C.P. 324.102 (1948), price 2s.) has just been issued by the British Standards Institution on behalf of the Codes of Practice Committee. This code gives guidance for the provision of adequate lighting in schools by electrical means, and is applicable to educational establishments of all types. The recommendations made relate not only to new buildings, but are applicable to the modernisation of existing school buildings.

B.S. Specification

B.S. Specification 398 of 1948 (price 2s. 6d.) on the Classification of Symmetrical Light Distributions from Lighting Fittings is the latest revision of the specification which was first published in 1930 and revised in 1936. The purpose of the standard is to define the common terminology by which the characteristics of lighting fittings may be described and compared.

City and Guilds Examinations in Illuminating Engineering

The results of the City and Guilds of London Institute examinations in illuminating engineering, which were held last May, have just been announced.

It is interesting to note that the number taking the Intermediate examination was about treble that for 1947. Of the 123 candidates 42 gained first-class passes and 56 second-class passes.

In the Final grade there were seven (as against 12 in 1947) entries in Section "A," there being four first-class and two second-class passes. In Section "B" the number of candidates increased from 12 last year to 20 in 1948. All candidates in this section were successful (11 first class and nine second class).

The names of the successful candidates are given below by kind permission of the Department of Technology of the City and Guilds of London Institute.

FINAL GRADE

SECTION "A"

GLASGOW:
First Class.—Cape, H.; Duff, R. I.

MANCHESTER:
First Class.—Russell, P. J.

OTHER CENTRES:
First Class.—Davies, P. D. *Second Class.*—Tye, R. L. M.; Lyons, S. L.

SECTION "B"

LONDON:
First Class.—Allen, P. W.; Burrows, R.; Christie, T. M.; Clack, F. J. G.; Dorey, G. M.; Ferguson, H. M.; Mounsdon, M. H.; Scott, G. P. *Second Class.*—Cooper, S. J.; Gamble, R. E. N.; Jones, F. T.; Jones-Thomas, G. D.; Ridout, G. P.; Singleton, G. O.; Westaway, E. J.

GLASGOW:
First Class.—Duff, R. I. *Second Class.*—Cape, H.

OTHER CENTRES:
First Class.—Davies, P. D.; Lyons, S. L. *Second Class.*—Russell, P. J.

INTERMEDIATE GRADE

LONDON:
First Class.—Ballard, J. C.; Bell, M.; Cahey, J. C.; Cartwright, D. E.; Chapman, D. F.; Charlesworth, D. E.; Chuck, H. L.; Cotton, R. J.; Cox, W. J.; Figgis, P. D.; Harrison, J. B.; Hart, G. F. A.; Jones, G. C.; Mallon, G. V.; Moody, A. H.; Murphy, V. A.; Nash, A. H.; Powley, M. J.; Roberts, T.; Roper, J. F.; Slinn, L. R.; Sunderland, T. D.; White, L. D.; Wray, B. *Second Class.*—Albini, C. A.; Algar, P. H.; Boucher, S. E.; Bradley, R.; Deane, R. B.; Gibbons, G. B.; Goslett, P. G.; Goulding, P. G.; Greenwood, J. L.; Hazel, H.; Heald, I. M.; Hoddinott, S. G. H.; Hooks, L. F.; Lee, D. N.; Legg, W. S.; Letchford, L. G.; Mutch, D. E.; Ormerod, R. W.; Palmer, R. C. C.; Pickering, T. E.; Picon, G. R.; Prickett, J.; Smith, V. J.; Turner, P. A.; Yates, R. T. C.

BIRMINGHAM:
First Class.—Longhurst, W. D. H.; Willdey, R. C. *Second Class.*—Birkett, S.; Chapman, F. E.; Higgins, A. W.; Johnson, M. K.; Morgan, C. H.; Wetten, A. C.

GLASGOW:
First Class.—Gavine, R. J. W.; Thomson, J. *Second Class.*—Allan, J.; Clark, J. G.; Colvin, D. R.; Corbett, R. M.; Hume, E. M.; Hunt, J. W. A.; Kellock, D.; Knight, I. D.; McMillan, W. M.; Renton, T. W.; Scott, J.; Shearer, R.; Whiteford, J.

MANCHESTER:
First Class.—Coupe, R. B.; McCauley, J. L.; Tooth, G. E.; Hartle, L. M. *Second Class.*—Clay, S. G. B.; Dawson, R. S.; Glenton, J. M.

LEEDS:
First Class.—Smith, E.; Walshaw, J. V.; Wilcock, A.; Pullan, W. E. *Second Class.*—Harrison, P. G.; Smith, N. D.; Tait, J. M.

OTHER CENTRES:
First Class.—Cunningham, B.; Hazell, R. S.; Staniforth, N. L.; Smith, T. D.; Styles, C. B. *Second Class.*—Hopkins, J. C.; Horner, C. J. N.; Lockwood, M. G.; Millington, F.; Styles, R. E.; Whitaker, W. G.; Wildish, D. G.

Visibility and the Atmosphere

A leaflet entitled "Visibility and the Optical Properties of the Atmosphere," which has recently been published by H.M. Stationery Office (price 6d. net), is a reprint of two memoranda prepared by Sir George Simpson during the war for the information of the Civil Defence Research Committee setting out the principles on which the Meteorological Office bases its observations of visibility. The theoretical relationships between the attenuation co-efficient, the daylight visibility range, and the distance at which lights can be seen at night are derived, and the practical difficulties of applying the theory are discussed.

A useful diagram is reproduced by which values of the visible range, the attenuation co-officient and the transmission co-efficient expressed in either the mile, the kilometre or 1,000 yards as the unit of length can be converted into the corresponding values for either of the other units.

The EDITOR Replies

It has been asked what is likely to be the effect upon the efficiency of office workers if the illumination of their work is reduced this winter, in order to meet the demand for a cut in the consumption of electricity. It is understood that in the premises of one of the leading banks lamps of lower wattage are now being substituted indiscriminately for those ordinarily used. For instance, at points normally equipped with 100-watt lamps, new lamps of 60-watt rating are being installed without proper regard to the number of hours of usage per day, to the nature of the work, or to the age of the workers. If such an unselective method is adopted to achieve the proportional cut demanded, it will not be surprising if the actual saving does not reach the target figure.

A 60-watt lamp has about half the lumen output of a 100-watt lamp, and a 50 per cent. reduction of illumination can reduce the speed and accuracy of vision quite appreciably if it is made from the level commonly found in offices under artificial light. So, if slower and less accurate work is the outcome of the illumination cut, this may lead to overtime, thereby consuming some of the electrical energy it is hoped to save.

The inflexible application of emergency rules of this kind, whether in the case of office lighting or in the lighting of streets and factories, is much to be deprecated. Appeals for a reduction of the winter load upon our generating plant should be accompanied by guidance as to how real economy can be effected.

Another query as to the "safety" of using fluorescent lighting prompts me to mention this matter again. It is worth repeating that if this method of lighting is harmful its ill-effects would, by now, have been so widely manifested as to have called forth condemnation by medical authorities. Not only has this not happened, but fluorescent lighting is installed at the Institute of Ophthalmology in London and in several medical research laboratories, as well as in some hospital operating theatres. We would not expect to find it in any of these places—least of all where eminent oculists, and others having special knowledge of vision, are exposed to it—if they themselves experienced ill-effects from it, or suspected it to be injurious to others. Surely these applications of fluorescent lighting bear witness to the confidence placed in it by those whom we would expect to be among the first to avoid it if it were harmful.

Relevant to the same question is the experience of a leading firm of radio valve manufacturers. Their valve factory was built during the war and has no windows. Fluorescent lighting is used continuously, but I am told there have been no complaints about it, nor is the sickness rate among the workers abnormally high. We hope shortly to publish an illustrated article dealing with the lighting of this factory.

Can we have too much light? This is a question posed more than once by users, in connection with schemes put forward for the re-lighting of their premises. The question is rather vaguely formulated, but it means, can we have more light than is comfortable or good for the eyes? Generally speaking, the answer is that even the most generous proposals likely to be made by competent lighting engineers will not provide for a level of illumination so

high as that we frequently enjoy, and find beneficial, in daytime. Indeed, in spite of the fact that during the past 20 years there has been a progressive fall in the cost of lumens derived from artificial light sources, the cost factor can still be relied upon to see that we have too little, rather than too much artificial light.

Strangely enough, it has been asserted that the reason why the use of glasses is now more prevalent than was the case 10 or 15 years ago is that sight is being impaired by the higher levels of illumination which have been adopted in many of our workplaces. If this were so, one wonders why it is that the wearing of glasses is not universal among those who work all day out of doors. The daily Press has recently reported the Minister of Health as saying that the rush for spectacles under the National Health Service has outstripped production, and that it seems to him "there is a most extraordinary proportion of the population which has bad eyesight." In fairness to the Minister, let it be said that he made no suggestion that excessive illumination has anything to do with this latest increase in the number of spectacle wearers.

Errata

Dr. N. A. Halbertsma has kindly drawn our attention to two errors which appeared on page 175 of the August issue, at the end of the article reporting the proceedings of the I.C.I. meeting in Paris.

It appears that at the dinner given to the members of the French Committee on July 6, Dr. Halbertsma acted as a toastmaster and interpreter, and the remarks which were attributed to him were first made by Mrs. Halbertsma, who made the presentations.

The speech on behalf of the Dutch delegates on this occasion was made by Mr. W. W. E. von Hemert, of the Dutch Ministry of Works.

Southampton Docks

I.E.S. members are reminded that a visit to Southampton Docks will take place on November 23 (see p. 184, September issue). It is now known that it will be possible for the party to go aboard the Queen Mary.

British Standard for Aircraft Lamps

The British Standards Institution has recently published a specification on aircraft lamps (B.S.E.19: 1948). This document covers the complete range of electric lamps used for aircraft purposes, and includes lamps for instruments and indicators, warning systems, cockpits, cabins, navigation, downwards identification, taxi-ing, landing, and general service lamps.

Copies of the specification can be obtained from the B.S.I. Sales Department, 24, Victoria-street, London, S.W.1, at a cost of 5s. (post free).

Stage Lighting at the Palace Theatre, Manchester

The re-equipment of the stage lighting of this theatre, which had been delayed by the war and the shortage of materials, has recently been completed by the Strand Electric and Engineering Co. Ltd.

The layout of the stage lighting and its control provided several problems. One of them was the lack of space on the stage for a manually operated board of the requisite size, whilst another was the very complex network of wiring dating from 1913 which appeared to honeycomb the building and of which no detailed knowledge was available. For these reasons it was decided to install a remotely controlled switchboard thus enabling the new installation to be completed without interference with the old.

The varied programmes provided by this theatre, ranging as they do from straight plays through twice nightly variety to elaborate musical comedy, demanded a very flexible system both in disposition and control of the various lighting units.

The equipment provided consists of three high intensity "Sunspot" arc lanterns burning 120 amps. A.C. which are situated at the back of the balcony. On the balcony front are twelve 1,000-watt "mirror spots" fitted with electrically operated colour change mechanism and six 1,000-watt parallel beam "Pageant" lanterns. On the grand circle front some of the old equipment has been retained for the time being but provision has been made for a further 6 kw. of lighting when required.

The stage equipment comprises five magazine battens and a footlight all fitted with 150-watt lamps at 9 in. centres and with specially designed reflectors to enable even illumination to be obtained with one lamp in four alight. Adjacent to each batten there is an internally wired barrel from which additional apparatus such as spots and acting area lanterns can be hung. The last barrel has provision for 16 floods for lighting the backcloth when required.

On the stage floor itself there are 40 outlets for floods, etc., connected to 20 dimmers. For the conventional manual board a space of 15 ft. 3 in. x 4 ft. x 8ft. 6 in. high would have been required, exclusive of working room, and this would have entailed the loss of a considerable amount of valuable stage room.

The switchboard actually installed was situated under the stage and operated by a control desk in the usual position on the perch but capable of being removed and operated in the auditorium for rehearsals, etc.

The size of the control desk is 3 ft. x 3 ft. x 4 ft. high, and it is virtually the equivalent of three separate 36 way switchboards which can be operated as one. The principle in use is that of the Strand Light Console, invented by Mr. F. P. Bentham, but the layout more closely resembles the normal switchboard than hitherto. Above each "Stop" or circuit selector is an indicator lamp which repeats the state of the corresponding connected load. There are a series of pre-set buttons which enable predetermined combinations of circuit selectors to be moved on and off at one touch. The functioning of the circuits selected is accomplished by means of the keyboard which is divided into three sections. By the use of coupling keys the complete installation can be operated from the centre section. Even the changing of the colour screens on the auto-spots is controlled from the desk. Various group controls and the motor speeds are foot operated.

This type of control can be used to accommodate up to 400 dimmers without increasing the loss of working space on the stage. Even with this number of dimmers the installation can still be operated by one man.

New Fluorescent Lamps

On October 1 members of the Electric Lamp Manufacturers Association added to their list of available lamps specially designed instant start 5-ft. fluorescent lamps of the standard colours, the list price being 16s. 6d. each. They are designed to work with special auxiliary gear. These lamps have the advantage of instant start without the use of a starter switch.

With a view to meeting situations, especially in shops and offices where fluorescent lamps of longer length are required, it is announced that as from January 1, 1949, E.L.M.A. members will be marketing two new lamps, each 8 ft. in length. Both will be in the "natural" colour, one being of 1 in. diameter, the other of 1½ in. diameter.

Recent Street Lighting Installations

Whilst lighting by means of electric discharge lamps is highly efficient, there are still many people who object to the slight deficiency in red in the spectrum, and for this reason the Street Lighting Department of Halifax, Yorkshire, decided to relight their city centre using tungsten filament lamps. They have, however, taken a long-term view and have employed lanterns which can be adapted for mercury discharge lamps should the colour of these lamps be materially improved.

The layout was planned by Mr. H. W. Lodge, the Public Lighting Superintendent of the County Borough of Halifax, to give a generous Class "A" installation. It was planned to use 500-watt and 750-watt tungsten filament lamps, but, owing to the present restriction, 300-watt and 500-watt lamps are being used for the time being. With the larger sizes of lamps installed a light output of 8,000 lumens per 100 foot linear will be obtained.

The complete installation comprises nearly 200 Stanton reinforced concrete columns sited to conform with the recommendations of the final report of the M.O.T.'s Departmental Committee. Special lanterns (suitable for accommodating 300/1,000-watt gas-filled lamps or 250/400-watt high pressure

mercury vapour lamps) employing outer bowl refractors and inner band refractors were designed and supplied for the installation. The use of the inner band enables a good distribution to be obtained with tungsten filament lamps and should it be desirable to change over at any time to mercury discharge lamps, the outer bowl alone can be used to give excellent results.

The equipment was supplied by Messrs. Siemens Electric Lamps and Supplies, Ltd.

Dundee

Following the introduction of fluorescent street lighting into a number of other Scottish cities, the Public Lighting Department of the Dundee Corporation has completed a similar installation in Reform-street, one of the Burgh's main thoroughfares.

This installation consists of a total of

six units each comprising three fluorescent lamp lanterns suspended from catenary wires and mounted at 26 ft. over the centre of the roadway. They are spaced at intervals of 120 ft. which is found to give very even coverage of the carriageway, pavements, and buildings. The lanterns were supplied by the B.T.H. Co., Ltd.

Wallasey

A further installation of fluorescent street lighting is that carried out by the Wallasey Corporation at Liscard-road, Wallasey, in which use is made of Metrovick "City" lanterns fitted with 5 ft. 80-watt warm white fluorescent lamps. The lanterns are mounted on existing tramway poles at 158 ft. spacing on one side of the road only. Liscard-road is a very busy shopping centre carrying a good flow of traffic.

London

Two new gas street lighting installations in London are on the London and Blackfriars Bridges, in both of which cases 10 light "London" lamps mounted at a height of 25 ft. on reinforced concrete standards have been used.